

JPRS 68544

28 January 1977

U S S R

EAST  
EUROPE

USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS

GEOPHYSICS, ASTRONOMY AND SPACE

No. 389

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<b>BIBLIOGRAPHIC DATA SHEET</b>		1. Report No. <b>JPRS 68544</b>	2.	3. Recipient's Accession No.	
4. Title and Subtitle <b>USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS - GEOPHYSICS, ASTRONOMY AND SPACE, No. 389</b>			5. Report Date <b>28 January 1977</b>		
7. Author(s)			6.		
9. Performing Organization Name and Address <b>Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201</b>			8. Performing Organization Rept. No.		
12. Sponsoring Organization Name and Address  <b>As above</b>			10. Project/Task/Work Unit No.		
			11. Contract/Grant No.		
15. Supplementary Notes			13. Type of Report & Period Covered		
			14.		
16. Abstracts  The report contains abstracts and news items on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial physics, covering both science news and formal scientific reports. Published details of Soviet space spectacles are included.					
17. Key Words and Document Analysis. 17a. Descriptors  USSR Geophysics Astronomy Astronautics Meteorology Oceanography  17b. Identifiers/Open-Ended Terms     17c. COSATI Field/Group 3, 4A, 4B, 8, 22					
18. Availability Statement <b>Unlimited Availability Sold by NTIS Springfield, Virginia 22151</b>			19. Security Class (This Report) <b>UNCLASSIFIED</b>		21. No. of Pages <b>52</b>
			20. Security Class (This Page) <b>UNCLASSIFIED</b>		22. Price

USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS  
GEOPHYSICS, ASTRONOMY AND SPACE

No. 389

This serial publication contains abstracts of articles from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

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## I. ASTRONOMY

### Abstracts of Scientific Articles

#### STRUCTURE OF UPPER LAYERS OF JOVIAN ATMOSPHERE

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 2, No 11, 1976, pp 549-553

[Article by A. V. Morozhenko and E. G. Yanovitskiy, Main Astronomical Observatory Ukrainian Academy of Sciences, "Parameters of the Vertical Structure of the Upper Layers of the Jovian Atmosphere"]

[Abstract] All presently available polarization and photometric observations of Jupiter in the visible and near-IR parts of the continuous spectrum are described well within the framework of a model of a homogeneous semi-infinite aerosol layer. However, in the absorption bands such a model is inapplicable, which makes it necessary to introduce the following inhomogeneous model of the vertical structure of the upper layers of the Jovian atmosphere: over a semi-infinite homogeneous gas-aerosol layer (clouds) there is a gas layer with a small optical thickness  $\tau_0$ . The article gives a determination of the parameters of this model. For this two-layer model of the Jovian atmosphere the authors estimate the atmospheric pressure at the boundary of the clouds ( $0.3 \pm 0.1$  atm), the abundance of methane ( $30 \pm 5$  m-atm) and ammonia ( $\leq 1$  m-atm) in the layer above the clouds, volume concentrations of methane ( $(2.3 \pm 0.7) \cdot 10^{-3}$ ) and ammonia ( $\leq (1.0 \pm 0.5) \cdot 10^{-4}$ ). Near the upper boundary of the cloud layer the authors estimate the volume coefficient of scattering of cloud particles at a wavelength  $0.725 \mu$  ( $\sigma_a \approx 3 \cdot 10^{-6} \text{ cm}^{-1}$ ) and their volume concentration ( $\sim 10^3 \text{ cm}^{-3}$ ).

[149]

#### FRESNEL REFLECTION OF SUN FROM VENUSIAN ATMOSPHERE

Moscow ASTRONOMICHESKIY VESTNIK in Russian Vol X, No 4, 1976, pp 190-194

[Article by A. I. Lazarev, State Optical Institute, "Estimates of Fresnel Reflection of the Sun from the Venusian Atmosphere"]

[Abstract] The author has made estimates of the brightness of Fresnel reflection of the sun from the Venusian atmosphere for phase angles from  $173^\circ$  to  $179^\circ$  and carried out a comparison with the brightness created by solar radiation diffusely reflected from the planet. It is demonstrated that it is possible to register Fresnel reflection from the Venusian atmosphere using a satellite-borne or ground coronagraph in the case of phase angles greater than  $175.5^\circ$ . It was possible to compute the resolutions of the ground and satellite coronagraphs necessary for these measurements. It is postulated that one of the phenomena observed by M. V. Lomonosov during the transit of Venus across the solar disk on 26 May 1761 could be interpreted as considerable Fresnel reflection of the sun from the Venusian atmosphere. The article gives an analysis of the possibility of M. V. Lomonosov observing this phenomenon by use of a telescope during the time of approach (withdrawal) of the Venusian disk toward (away from) the solar disk.

[147]

#### RADIOBRIGHTNESS MEASUREMENTS OVER THE JOVIAN DISK

Moscow ASTRONOMICHESKIY VESTNIK in Russian Vol X, No 4, 1976, pp 201-204

[Article by T. V. Smirnova and A. D. Kuz'min, Physics Institute USSR Academy of Sciences, "Radiobrightness Measurements Over the Jovian Disk"]

[Abstract] In this paper it is demonstrated that when carrying out an experiment for measuring the distribution of radiobrightness over the Jovian disk it is best to use a wavelength of 2 cm. On the planetary disk the most critical planetary atmospheric parameters for investigation are along a section on the planetary disk  $x_c = 0.9$ . The radiobrightness distribution function  $F(x_c)$  can yield information on the ammonia concentration in the Jovian atmosphere and pressure at the level of formation of the  $\text{NH}_3$  lines if the measurement accuracy is not less than 2%. Otherwise it will be possible to obtain only the lower boundary for the parameters  $P_0$  and  $f_{\text{NH}_3}$ . It was found that it is preferable to make measurements of the distribution of radiobrightness over the Jovian disk using telescopes having a directional diagram width  $\vartheta_{0.5} > 10''$ .

[147]

#### TELEVISION OBSERVATIONS OF METEORS

Moscow ASTRONOMICHESKIY VESTNIK in Russian Vol X, No 4, 1976, pp 241-246

[Article by A. P. Vid'machenko, Ye. P. Vashchenko, V. N. Ivchenko and Ye. V. Sandakova, Astronomical Observatory Kiev State University and Kiev Teachers Institute, "Experience with Television Observations of Meteors"]

[Abstract] The article reviews the results of observations of meteors carried out with television apparatus. There is a discussion of the problems involved in the use of such apparatus for solving specific problems in meteor investigations. The observations were made at Pachikha village in Arkhangel'skaya Oblast. During the observations the authors observed a series of meteors from  $-5^m.0$  to  $7^m.5$ . The paper describes in detail one particular meteor registered on 15 February 1975 at 0115 UT. At the maximum the integral brightness was  $5^m.0$ . The entire event lasted  $2^s.0$ . It was registered on 10 motion picture frames which are reproduced in the text and which serve as the basis for the discussion. The authors feel that television observations of meteors can be made using relatively simple equipment designed on the basis of commercial television equipment with camera tubes of the superorthicon and isocon types. The use of such outfits makes it possible to register meteors which are  $4^m-5^m$  fainter in comparison with the photographic method. However, television equipment built on the basis of commercial equipment has a number of shortcomings in comparison with specially designed outfits, but this does not diminish the possibilities of their use.

[147]

## II. METEOROLOGY

### News

#### COLLECTION OF PAPERS ON CLOUD PHYSICS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9B42K

[Abstract of collection of articles; Tbilisi, FIZIKA OBLAKOV (Cloud Physics), TRUDY IN-TA GEOFLIZIKI AN GruzSSR, No 36, "Metsniyereba," 1975, 89 pages]

[Text] Table of Contents: G. Z. Zydinova, "Applicability of the Slice Method for Predicting the Altitude of the Upper Boundary of Cumulus Clouds in Mountainous Terrain"; G. Z. Eydinova and D. D. Kirkitadze, "On the Problem of Natural Crystallization of the Tops of Well-Developed Cumulus Clouds"; A. I. Kartsvadze, T. G. Salukvadze, V. A. Lapinskas, "Some Problems in the Method for Modifying Hail Processes Using Anti-Hail 'Alazani' System"; T. G. Salukvadze, "Accuracy in Measuring the Height of the Upper Boundary of Radioechoes from Convective Clouds"; A. A. Ordzhonikidze, Z. Ye. Kikacheyshvili and V. Kh. Bokhashvili, "Mechanism of Hail Formation and Some New Considerations on the Artificial Modification of Hail Processes"; K. M. Chochishvili, "Investigation of the Ice-Forming Activity of Phthalic Acids in a Small Cloud Chamber," "Determining the Correction Factor for Computing the Appearance of Ice Crystals in a Laboratory Cloud Chamber"; N. G. Yershova, "Some Problems in Deactivation of the Aerosol Phloroglucinol; Ya. R. Akhvlediani, "Computation of Deformation of Droplets of a Water Solution of Electrolyte in an Electric Field"; Ya. R. Akhvlediani and A. M. Okudzhava, "Role of Accumulated Heat in the Freezing of a Spherical Droplet"; A. G. Nodiya, "Investigation of the Electric Characteristics of Convective Clouds"; D. F. Kharchilava, G. P. Khocholava, L. S. Sarkisova and I. A. Mukhraneli, "Correlation of Vertical Air Velocity with the Total Ozone Content for Different Pressure Levels and Fields"; B. I. Styro, A. G. Amiranashvili and T. G. Khundzhua, "On the Problem of Determining the Constant Elution of Aerosols of Short-Lived Decay Products of Radon-222 in Convective Clouds"; M. A. Odishariya and V. A. Chikhladze, "Experimental Apparatus for Measuring the Attenuation of Intensity of Laser Radiation in a Cloud Chamber." [162]

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AMDERMA HYDROMETEOROLOGICAL STATION IN OPERATION

Moscow IZVESTIYA in Russian 16 Dec 76 p 5

[Article by A. Alin: "All-Weather Device"]

[Text] Amderma. At the Amderma Administration of the Hydrometeorological Service a standardized automatic telemetering hydrometeorological station has been put into operation. It has made it possible to continuously follow weather conditions. At fixed periods the station automatically measures meteorological elements, composes a telegram, and sends it to forecasting agencies. This marks the beginning of the automation of meteorological observations under severe arctic conditions. [5]

## Abstracts of Scientific Articles

### MODERN METHODS IN METEOROLOGY

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9B1

[Abstract of article by Wolfgang Bohme; Berlin, SITZUNGSBER. AKAD. WISS. DDR, No 1N, 1975, pp 57-68, "Modern Methods in Meteorology"]

[Text] Although the unreliability of meteorological forecasts has decreased during the last hundred years, it still remains significant, especially for predictions for a period of more than 36 hours in advance. For 36-hour alternative forecasts the probable success is 85%. The probable success of forecasts for a period of four-five days has the probable success of random prediction. The prediction process can be represented in the form  $I(t + \Delta t) = F(t - \tau)J(t - \tau)$ , (1)  $t \geq 0$ ,  $\Delta t > 0$ ,  $\tau \geq 0$ . The F operator expresses the transformation of the initial information I into information at the output J. It replaces the system of equations of atmospheric dynamics. The principal fundamental error in forecasting I is associated with the inadequacy of the F operator to describe a real process in the atmosphere (turbulence, interaction of scales, phase transitions and the radiation energy sources controlled by them, unstable equilibrium in the atmosphere). Other errors are associated with an inadequate density of the network and errors in measurements of the initial information J. Then the paper discusses ways to overcome existing difficulties (method of parameterization of small-scale processes, automatic stations, satellites, radar, etc.). The author also touches on international research projects (TROPEX, GATE and others). [162]

### DYNAMICS OF MELTING OF SNOW COVER

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9V401

[Abstract of article by Yu. V. Kurilova, P. A. Kolosov, L. K. Poplavskaya and Yu. S. Sokolov; Moscow, TRUDY GIDROLOG. IN-TA, No 237, 1976, pp 22-31, "Investigations of the Dynamics of Melting of the Snow Cover on the Basis of Data from Meteorological Satellites"]

[Text] This paper is devoted to an analysis of different methodological approaches in an investigation of the dynamics of melting of the snow cover on the basis of satellite data. For studying the process of thawing of the snow cover the authors used images obtained from the meteorological satellite "Meteor-10" for March 1972. The satellite orbits passed over the eastern part of the European USSR, especially over the basins of the Don and Volga Rivers. The "Meteor-10" satellite ensured the daily collection of information and after three to four days provided images of the underlying surface under almost cloud-free conditions. The absence of registry of the absolute brightnesses on images from meteorological satellites considerably limited the possibilities of obtaining precise quantitative estimates. Distortions of perspective due to tilting of the optical axis of the instrument were eliminated using a photorectifier when constructing a photomosaic (scale 1:5,000,000). The analysis was made using a series of nine such photomosaics constructed for March 1972. Bibliography of three items.

[162]

#### VARIATIONS IN ATMOSPHERIC CIRCULATION OVER ATLANTIC OCEAN

Moscow IZVESTIYA VSESOYUZNOGO GEOGRAFICHESKOGO OBSHCHESTVA in Russian  
Vol 108, No 5, 1976, pp 385-391

[Article by R. V. Abramov, "Structure of Synchronous Macrovariations of Atmospheric Circulation Over the Atlantic Ocean"]

[Abstract] On the basis of monthly differences in atmospheric pressures between four paired stations for 1895-1950 the spectral analysis method is used in investigating the structure of changes in circulation over the Atlantic Ocean (63°N-54°S). The most intensive transfer of air masses is from west to east in the temperate zones of both hemispheres. The contribution of the annual wave to the total spectrum is about 1/3. The "circulation" year can differ from the astronomical year by 2-3%. A semiannual wave is discovered in all latitude zones. The zone of the Southeast Trades is characterized by a regularity of variations. Energy scattering in the high-frequency region is minimum here. There was found to be a variation synchronous in all latitude zones with a mean duration of about 18.5 years. The principal and secondary peculiarities of this variation are satisfactorily explained on the basis of the proposed physical model: in the earth's atmosphere the 18.6-year variation of the lunar orbit excites a tidal standing wave with antinodes at the poles and at the equator and nodal lines at parallels  $\pm 35^\circ$ . The prognostic significance of the phenomenon is emphasized.

[172]

## THEORY AND PRACTICE OF WEATHER FORECAST VERIFICATION

East Berlin ZEITSCHRIFT FUR METEOROLOGIE in German Vol 26, No 6, 1976, pp 349-359

[Article by K. Balzer, Meteorological Service of the German Democratic Republic, Central Weather Service Station, Potsdam, "On the Theory and Practice of the Verification of Weather Forecasts"]

[Abstract] Since the summer of 1970, the short-range forecasts issued at Warnemunde, Potsdam, Leipzig, Erfurt and Dresden and the medium-range weather forecasts issued in Potsdam undergo verification. Since numerous data are involved, they are processed by a BESM-6 electronic data processing system. The data on meteorological parameters such as temperature extremes, precipitation, number of hours with sunshine, ground wind direction and ground wind velocity are punched onto 79-column cards twice a day and are processed monthly. Statistically valid verifications are obtained over six-month periods. From the verifications conclusions are drawn concerning the range of predictability, trends for improvement or deterioration of forecast quality and the quality of weather forecasting in the areas studied. There has been an improving quality trend in all aspects of the forecasts; however, the predicted precipitation and the number of hours with sunshine are less accurate than the other meteorological parameters. The data obtained in the study may be used for the formulation of measures aimed at improving the quality of forecasts.

[148]

## JET STREAMS OVER GERMAN DEMOCRATIC REPUBLIC

East Berlin ZEITSCHRIFT FUR METEOROLOGIE in German Vol 26, No 6, 1976, pp 330-338

[Article by M. Kasper, "A Contribution to the Climatology of the Jet Stream Over the Territory of the German Democratic Republic"]

[Abstract] Several radiosonde ascents were made in Greifswald, Lindenberg and Dresden to collect data on the jet streams flowing over East Germany. The information obtained from these ascents on cases of strong wind in the maximum wind layer, wind velocity, altitude of the layer center, shear force above and below 1,000 m, shear force at 500 and 300 mbar, distance from the ascent axis, maximum velocity on the axis and horizontal shear force was evaluated statistically and tabulated for the period 1961-1970 using a library program of the Meteorological Service on a BESM-6 computer. The data are useful for flight work. It is shown that such data on strong wind processes permit extensive climatological conclusions to be reached with respect to jet streams and provide background for improved weather forecasting. Criteria are given for evaluating a jet stream as a dynamic process.

[148]



### III. OCEANOGRAPHY

#### News

#### NEW MONOGRAPH ON MEASURING OCEAN CURRENTS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 8, 1976, 8V27K

[Abstract of monograph by V. B. Titov, V. G. Krivosheya and S. T. Mikhaylov; Moscow, IZMERENIYE TECHENIY V OKEANE YAKORNYMI BUYKOVYMI STANTSIYAMI, Izd-vo "Nauka," 1976, 74 pages]

[Text] Contents of the monograph. Chapter I. Equipment for abyssal buoy stations: Buoy stations (supporting buoys; supports for suspending the instruments to the buoy line; anchor; devices for buoy stations); deck hoisting mechanisms and devices for buoy stations (hoists for raising and lowering buoys and anchors; oceanographic winches for buoy stations; devices for letting out the cable over the ship's side; requirements for setting up deck equipment on scientific research ships). Chapter II. Errors in measuring current with BPV instruments: Errors in measuring current direction (errors in measuring the velocity modulus; influence of the horizontal component of wave velocity on the accuracy in measuring the current velocity modulus; influence of yawing of the instrument housing in the flow on measurement of current velocity; influence of vertical fluctuations on the accuracy of measurement of the current velocity modulus); reliability and autonomy of operation of instruments of the BPV type); Chapter III. Methods for abyssal buoy stations: Preparations for measurements at buoy stations (selection and outfitting of buoys; designing and fabrication of buoy lines; selection of optimum weight and design of anchor systems, preparation of consignments of instruments); Placement and removal of buoy stations; Bibliography.

[109]

#### WORK OF USSR SCIENTIFIC RESEARCH FLEET DISCUSSED

Moscow PRIRODA in Russian No 11, 1976, pp 4-15

[Article by L. M. Brekhovskikh, "Investigations of the World Ocean"]

[Abstract] Academician Brekhovskikh reviews the work of the USSR Scientific Research Fleet. The following subjects are noted, with only a paragraph or so devoted to each: fish and other biological resources, mineral resources, ocean transportation, weather forecasting. Some recent accomplishments in oceanology are covered, followed by a rather sketchy coverage of some future fields of endeavor in studying the ocean. However, the most interesting part of the article is individual photographs of research ships [although no technical data are given]: "Voyeykov," "Akademik A. Kovalevskiy," "G. Yu. Vereshchagin," "Akademik Knipovich," "Akademik Kurchatov," "Akademik Ber," "Akademik Shirshov," "Professor Zubov," "Akademik Sergey Korolev," "Kosmonavt Vladimir Komarov," and "Kosmonavt Yuriy Gagarin."

[116]

## Abstracts of Scientific Articles

### IRREGULARITY OF OCEAN SURFACE

Moscow PRIRODA in Russian No 11, 1976, pp 106-111

[Article by Yu. A. Tarakanov, "The Uneven Ocean Surface"]

[Abstract] It has been found that on the ocean surface there are five gigantic irregularities -- planetary anomalies: Indian, Australian, Californian, Caribbean, North Atlantic, which range in breadth from 3,000 to 5,000 km. To the south of the Indian subcontinent, almost at the latitude of the equator, the ocean surface dips 112 m. To the northeast of Australia, close to the equator, the ocean is uplifted 78 m. A thousand kilometers to the southwest of California there is a depression in the ocean surface with a depth of about 56 m. In the Atlantic Ocean adjacent to North and South America the ocean is 64 m lower than average. Between Greenland and Europe the water surface in two places is uplifted by 66 and 68 m. A map accompanying the text shows the location and intensity of these anomalies. One of the reasons for the existence of these anomalies is a nonuniform structure of the deep layers of the earth. The relief of the ocean surface carries information on the earth's gravity field. This information leads to some additional conclusions concerning the earth's internal structure. In this paper it is postulated that at depths of 400-900 km there are sources of disturbance of the ocean surface. There is evidence that beneath the rises on the ocean surface at the mentioned depths there are masses of increased density, whereas beneath the depressions there are masses of reduced density which are associated with zones of phase transition of terrestrial matter.

[116]

#### IV. TERRESTRIAL GEOPHYSICS

##### News

##### MONOGRAPH ON SOLVING PROBLEMS IN STRUCTURAL GEOLOGY

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9D197K

[Abstract of monograph by Ye. G. Bulakh, V. A. Rzhanitsyn and M. N. Markova; Kiev, PRIMENENIYE METODA MINIMIZATSII DLYA RESHENIYA ZADACH STRUKTURNY GEOLOGII PO DANNYM GRAVIRAZVEDKI, "Naukova Dumka," 1976, 220 pages, "Use of the Minimization Method for Solving Problems in Structural Geology Using Data from Gravimetric Prospecting"]

[Text] On the basis of the minimization method the authors have devised an automated system for the interpretation of gravity anomalies. It consists of individual stages. In the interpretation process it is possible to solve the direct problem, the background function is computed, and the parameters of complex geological structures in a three-dimensional distribution are determined. By means of an automated system, using gravimetric prospecting data, a study is made of the geological structure of different regions. The authors solve problems directed to study of the relief of the buried basement, folded and folded-block structures of sedimentary and crystalline rocks, ore bodies and intrusive complexes, regions of development of salt dome tectonics, etc. With the use of the entire complex of geological-geophysical data and on the basis of the results of deep seismic sounding the authors also construct a full density model of the earth's crust within the limits of the investigated territory. The monograph is intended for geophysicists and geologists and also students in advanced courses in geophysics and geology departments.

[162]

##### MONOGRAPH ON GEOPHYSICAL STUDY OF EARTH'S INTERIOR

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9G7K

[Abstract of brochure by K. I. Lukashev and Zh. P. Khot'ko; Minsk, GEOFIZICHESKOYE IZUCHENIYE ZEMNYKH NEDR I OKOLOZEMNOGO KOSMICHESKOGO PROSTRANSTVA, 1976, 53 pages (Geophysical Study of the Earth's Interior and Circumterrestrial Space)]

[Text] This brochure gives the results of investigations carried out at the Institute of Geochemistry and Geophysics Academy of Sciences Belorussian SSR by the Division of Physics of the Earth and the geophysical observatory at Pleshchenitsi. The authors describe the state of research in individual important directions in geophysical science and problems in the further geophysical study of the earth's crust and mantle in Belorussia. Bibliography of 75 items.

[162]

## Abstracts of Scientific Articles

### THERMAL WATERS AND SEISMIC ACTIVITY

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9G119

[Abstract of article by Ye. K. Markhinin and L. I. Bozhkova; --, BYUL. VUL-KANOL. ST. DAL'NEVOST. NAUCH. TSENTR AN SSSR, No 52, 1976, pp 37-41, "Dependence of the Chemical Composition of Thermal Waters on Seismic Activity"]

[Text] A study was made of the dependence between the chemical composition of a number of thermal springs on Kunashir Island and earthquakes. The conclusion is drawn that with an increase in seismicity in the investigated thermal waters there is an increase in the content of some chemical components, in particular, Cl, SO<sub>4</sub>, CO<sub>2</sub> and NH<sub>4</sub>.

[162]

### COMPUTER PROCESSING OF DEEP SEISMIC SOUNDING DATA

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9G179

[Abstract of article by Yu. A. Budyanskiy and E. G. Zhil'tsov; --, TRUDY SAKHALIN. KOMPLEKS. NII DAL'NEVOST. NAUCH. TSENTRA AN SSSR, No 37, pp 234-237, 1975, "Results of Computer Processing of Deep Seismic Sounding Data Along Sea Profile T-4"]

[Text] The article gives the results of testing of a continuous processing complex along sea profile T-4 situated to the east of Shikotan Island. The method makes it possible to carry out wave correlation with increasing similarity between the signals (the similarity measure satisfies seven axioms described in the paper) and to construct a seismic cross section. On the seismograms it is also possible to discriminate a wave from a discontinuity in the mantle P:<sub>2</sub><sup>M</sup> and to refine the position of the deep discontinuities.

The model of the earth's crust in general was found to be more low velocity; below the M discontinuity one can discriminate a layer with a thickness of 4-5 km with  $V_p = 8.0-8.1$  km/sec.  
[162]

#### FOURIER ANALYSIS FOR GRAVITY-MAGNETIC DATA

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9D199

[Abstract of article by D. Milcoveanu; Bucharest, STUD. SI CERC. GEOL., GEOFIZ., GEOGR. SER. GEOFIZ., 13, 1975, pp 91-132, "Use of Fourier Analysis in the Interpretation of Gravimetric and Magnetometric Data"]

[Text] The interpretation is made by comparison of a real anomaly with one or more theoretical anomalies. The article gives examples of the modeling of different structural forms. The author gives the spectra of the corresponding anomalies and the autocorrelation function. The proposed method can be used in the interpretation of data from gravimetric, magnetic and airborne magnetometer data and seismic prospecting. The first part of the paper is devoted to solution of the one-dimensional prospecting problem and the second part is devoted to two-dimensional prospecting.  
[162]

#### CALIBRATION AND RESPONSE OF GRAVITY DETECTOR

Moscow ASTRONOMICHSKIY ZHURNAL in Russian Vol 53, No 6, 1976, pp 1330-1337

[Article by A. I. Gusak, All-Union Scientific Research Institute of the Metrological Service, "Calibration and Response of a Gravity Detector"]

[Abstract] In this paper the author examines a method for calibrating a gravity detector - high-frequency gravimeter. It is noted that the gravity detector can operate in two regimes: in a gravimeter regime -- registry of high-frequency variations of the earth's gravity  $\Delta g$  (in the frequency region  $\sim 1177$  Hz); in a seismograph regime -- registry of high-frequency vertical displacements of the ground (in the same frequency range). In accordance with the considered calibration method the response of the high-frequency gravimeter (with averaging for all the records obtained) was  $\sim 10^{-11}$  g; the response (preliminary) of the high-frequency seismograph (without averaging of records) was  $\sim 10^{-12}$  cm. It is shown that the signals registered with the high-frequency gravimeter cannot be attributed to the influence exerted on it by vertical displacements of the ground (microseisms). A control experiment revealed that the signals discovered with the high-frequency gravimeter cannot be caused by its exposure to electromagnetic radiation.  
[163]

## HYDROGEOLOGICAL INTERPRETATION OF SPACE SURVEY

Moscow SOVETSKAYA GEOLOGIYA in Russian No 11, 1976, pp 129-134

[Article by A. V. Sadov and L. G. Khimichev, All-Union Scientific Research Institute of Hydrology and Engineering Geology, "Hydrogeological Interpretation of Space Survey Materials of the Aragats Complex"]

[Abstract] The paper gives the results of hydrogeological investigations of the Aragats mountain complex in the Armenian SSR. The study is based on the use of materials from aerial and space surveys. New data are presented on the tectonic structure of the complex and adjacent territories which have been obtained in these aerial and space surveys. On the basis of the structural-tectonic map compiled by the authors it was possible to give a hydrogeological interpretation of the discriminated structures and a new map of hydrogeological regionalization of the investigated territory is presented. The authors illustrate the good possibilities of using space photographs for regional hydrogeological investigations.

[171]

## ROLE OF GEOLOGICAL-TECTONIC ELEMENTS IN SEISMIC ACTIVITY

Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH, KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian No 5, 1976, pp 99-102

[Article by O. A. Odekov and E. M. Esenov, Institute of Physics of the Earth and Atmosphere Turkmen Academy of Sciences, "Role of Geological-Tectonic Elements in the Appearance and Distribution of Intensity of Seismic Oscillations"]

[Abstract] The evaluation of seismic intensity is influenced considerably by the presence of tectonic dislocations (depth, extent, direction) which in definite combinations can play some screening role on the path of wave propagation, attenuating oscillations, or, on the contrary, magnifying them in dependence on the location of the focal zone relative to the regionalization territory. In order to refine and make more detailed the discovered dependence, in addition to a qualitative explanation of the studied phenomenon one must proceed to a quantitative description; this can be regarded as one of the tasks for further research on improvement in the microregionalization method.

[169]

## EVALUATING THE POSITION ACCURACY OF GEODETIC STATIONS

Moscow GEODEZIYA I KARTOGRAFIYA in Russian No 10, 1976, pp 19-23



[Article by N. I. Nevzorov, "Evaluating the Position Accuracy of Geodetic Stations"]

[Abstract] The author points out the approximate nature of the formula used for computing the mean square error in the position of a station. It is shown that the accuracy evaluation must be made taking into account the distribution of coordinate errors. In the case of a circular scatter the position error is the error along the coordinate axes; in the case of an elliptical scatter it is necessary to compute the values and directions of the extremal errors. The article gives the results of experimental checking of the distribution of coordinate errors and the probability of their falling into an ellipse in the example of a small model trilateration network.  
[166]

#### CONDITIONS FOR OCCURRENCE OF EARTHQUAKES INDUCED BY MAN

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 10, 1976, pp 33-47

[Article by N. I. Nikolayev, Moscow State University, "Tectonic and Tectonophysical Conditions for the Appearance of Earthquakes Associated with Man's Engineering Activity"]

[Abstract] Concentrated in the earth's deep layers are enormous reserves of potential energy associated with stresses accumulated in the earth's crust. The release of elastic energy during man's engineering activity is manifested in unstable, tectonically "prepared" zones. The creation of reservoirs causes a release of elastic stresses with the formation of excited earthquakes with a class higher than that determined on the basis of seismic regionalization. In this process there is a change in the frequency of tremors, the regime of release of seismic energy and the localization of the epicenters predetermined by tectonic activity.  
[165]

## V. UPPER ATMOSPHERE AND SPACE RESEARCH

### News

#### PLANS TO CONDUCT ROCKET LAUNCHES IN TWO AREAS OF THE PACIFIC

Moscow PRAVDA in Russian 12 Dec 76, p 4

[TASS Report]

[Text] During the period from 13 through 30 December 1976 the Soviet Union will conduct launches of booster rockets into the following regions of the Pacific Ocean:

- a region bounded by a circle with a radius of 50 nautical miles with its center at the coordinates 33 degrees 30 minutes North Latitude and 177 degrees 7 minutes West Longitude;
- a region bounded by a circle with a radius of 25 nautical miles with its center at the coordinates 39 degrees 27 minutes North Latitude and 177 degrees 24 minutes East Longitude.

TASS has been authorized to announce that for purposes of safety the government of the USSR requests the governments of other countries using the sea and air lanes in the Pacific Ocean to instruct appropriate agencies so that ships and aircraft will not enter these regions or the air space above them during the indicated period daily in the afternoon from 1200 hours to 2400 hours local time.

In connection with the completion of planned booster rocket launchings, the region of the Pacific Ocean bounded by a circle with a radius of 100 nautical miles with its center at the coordinates 46 degrees North Latitude and 164 degrees East Longitude, as published on 7 December 1976, is open to navigation and aircraft flights as of 11 December 1976.

[4]

# TASS ANNOUNCES LAUNCHING OF "MOLNIYA-2" COMMUNICATIONS SATELLITE

Moscow PRAVDA in Russian 3 Dec 76, p 1

[TASS Report: "Molniya-2"]

[Text] In accordance with the program for further development of communication systems using artificial earth satellites, on 2 December 1976 a "Molniya-2" communications satellite was launched from the Soviet Union into a high elliptical orbit. The satellite has an on-board repeater apparatus providing for operation of the system in the centimeter wave range.

The "Molniya-2" communications satellite is intended for operation in the system of long-range telephone and telegraph radio communication in the Soviet Union, for transmission of USSR Central Television programs to points in the "Orbita" network, and for international cooperation.

The satellite was inserted into an orbit with the following parameters:  
-- apogee, 40,608 kilometers in the Northern Hemisphere;  
-- perigee, 657 kilometers in the Southern Hemisphere;  
-- period of revolution, 12 hours 16 minutes;  
-- orbital inclination, 62.8 degrees.

In addition to apparatus for transmission of television programs and for providing long-range multichannel radio communication, the satellite carries a command and measurement complex and also systems for orientation, orbital correction, and power supply for the satellite.

Communications sessions using the "Molniya-2" satellite will be conducted in accordance with the planned program.

[5]

# TASS ANNOUNCES LAUNCHING OF "KOSMOS-881" AND "KOSMOS-882"

Moscow PRAVDA in Russian 16 Dec 76 p 2

[TASS Report: "The Program Has Been Carried Out"]

[Text] On 15 December 1976 the artificial earth satellites "Kosmos-881" and "Kosmos-882" were launched in the Soviet Union. The satellites were inserted into orbit by a single carrier rocket.

The satellites carry scientific apparatus and also have radio systems for precise measurement of orbital elements and radiotelemetry systems for transmitting data on the operation of the instruments and scientific apparatus to earth.

The satellites were inserted into an orbit with the following parameters:

- apogee, 248 kilometers;
- perigee, 202 kilometers;
- orbital inclination, 51.6 degrees.

The scientific researches planned in the program have been carried out. [4]

#### CZECH X-RAY PHOTOMETER ABOARD "PROGNOZ-5" SATELLITE

Moscow PRAVDA in Russian 16 Dec 76 p 5

[Article by I. Biryukov: "Instrument for Satellites"]

[Text] Prague, 15 December. Czechoslovakian scientists are actively participating in the joint space research being conducted within the framework of the "Interkosmos" program of the socialist countries.

One of the instruments intended for these purposes is the X-ray photometer created by the electrical engineering enterprise "Tesla" and the Scientific Research Institute for Communication Facilities imeni A. S. Popov in Prague. The instrument has been installed on the "Prognoz-5" satellite. [4]

#### TASS ANNOUNCES LAUNCHING OF "KOSMOS-883"

Moscow PRAVDA in Russian 17 Dec 76 p 3

[TASS Report: "'Kosmos-883'"]

[Abstract] The artificial earth satellite "Kosmos-883" was launched in the Soviet Union on 15 December 1976. The satellite was inserted into an orbit with the following parameters:

- initial period, 105 minutes;
- apogee, 1,023 kilometers;
- perigee, 975 kilometers;
- orbital inclination, 83 degrees.

#### PLANS TO CONDUCT ROCKET LAUNCHES IN THE PACIFIC

Moscow PRAVDA in Russian 17 Dec 76 p 5

["Tass Report"]

[Text] During the period from 20 through 30 December 1976 the Soviet Union will conduct launches of booster rockets into regions of the Pacific Ocean each bounded by a circle with a radius of 100 nautical miles with their centers at the coordinates: 46 degrees North Latitude, 164 degrees East Longitude; and 32 degrees 27 minutes North Latitude, 170 degrees 10 minutes East Longitude.

TASS has been authorized to announce that for purposes of safety the government of the Soviet Union requests the governments of other countries using the sea and air lanes in the Pacific Ocean to instruct appropriate agencies so that ships and aircraft will not enter this region or the air space above it during the indicated period from 2200 hours until 1200 hours local time.

In connection with the successful completion of planned booster rocket launches the following regions of the Pacific Ocean, announced on 10 December, will be free for navigation and aircraft flights as of 16 December 1976: the region bounded by a circle with a radius of 50 nautical miles with its center at the coordinates 33 degrees 30 minutes North Latitude and 177 degrees 7 minutes West Longitude and the region bounded by a circle with a radius of 25 nautical miles with its center at the coordinates 39 degrees 27 minutes North Latitude and 177 degrees 24 minutes East Longitude.

#### TASS ANNOUNCES LAUNCHING OF "KOSMOS-884"

Moscow PRAVDA in Russian 18 Dec 76 p 2

[TASS Report: "'Kosmos-884'"]

[Abstract] The artificial earth satellite "Kosmos-884" was launched in the Soviet Union on 17 December 1976. The satellite was inserted into an orbit with the following parameters:

- initial period, 89.6 minutes;
- apogee, 346 kilometers;
- perigee, 178 kilometers;
- orbital inclination, 65 degrees.

#### TASS ANNOUNCES LAUNCHING OF "KOSMOS-885"

Moscow PRAVDA in Russian 18 Dec 76 p 2

[TASS Report: "'Kosmos-885'"]

[Abstract] The artificial earth satellite "Kosmos-885" was launched in the Soviet Union on 17 December 1976. The satellite was inserted into an orbit with the following parameters:

- initial period, 94.4 minutes;
- apogee, 513 kilometers;
- perigee, 470 kilometers;
- orbital inclination, 66 degrees.

#### TASS ANNOUNCES COMPLETION OF ROCKET TESTS IN PACIFIC

Moscow PRAVDA in Russian 23 Dec 76 p 4

["TASS Announcement"]

[Text] In connection with the completion of planned launches of booster rockets, TASS has been authorized to announce that the regions of the Pacific Ocean each bounded by a circle with a radius of 100 nautical miles with their centers at the coordinates 46 degrees North Latitude, 164 degrees East Longitude and 32 degrees 27 minutes North Latitude, 170 degrees 10 minutes East Longitude, as announced on 16 December 1976, are open for navigation and aircraft flights as of 22 December 1976. [4]

#### PLANS TO CONDUCT ROCKET LAUNCHES IN BARENTS SEA

Moscow PRAVDA in Russian 25 Dec 76 p 4

["TASS Announcement"]

[Text] During the period from 28 through 30 December 1976 the Soviet Union will conduct rocket launches to a region of the Barents Sea limited by a circle with a radius of 40 nautical miles with its center at the coordinates 73 degrees 00 minutes North Latitude and 35 degrees 00 minutes East Longitude.

TASS has been authorized to announce that for purposes of safety the government of the Soviet Union requests the governments of other countries using the sea and air lanes in the Barents Sea to instruct appropriate agencies so that ships and airplanes do not enter this region or the air space above it from 1300 hours to 1700 hours local time. [4]

#### TASS ANNOUNCES LAUNCHING OF "KOSMOS-886"

Moscow PRAVDA in Russian 29 Dec 76 p 3

[TASS Report: "'Kosmos-886'"]

[Abstract] The artificial earth satellite "Kosmos-886" was launched in the Soviet Union on 27 December 1976. The satellite was inserted into an orbit with the following parameters:

- initial period, 115 minutes;
- apogee, 2,328 kilometers;
- perigee, 581 kilometers;
- orbital inclination, 66 degrees.

The scientific studies planned in the program have been completed. The information obtained is being processed at the coordination-computation center.

#### COMPLETION OF POLAR AURORA EXPERIMENT

Moscow PRAVDA in Russian 16 Dec 76 p 3

[TASS Report: "A Meeting with the Polar Aurora"]

[Text] The series of launches of high-altitude drifting balloons (Project SAMBO-76) has been successfully completed. The series of launches was conducted from 10 November to 15 December within the framework of international cooperation in the study and use of space.

The purpose of the launches was to study the processes associated with the polar aurora: X-ray bremsstrahlung of electrons, changes in the electric field, and the glow of the upper atmosphere were investigated. Specialists from the USSR, Sweden and France participated in the preparation and execution of the experiment.

In the course of the experiments a total of 14 balloons with scientific apparatus were launched from the territory of Sweden (city of Karuna).

In accordance with winter wind conditions, the balloons drifted at altitudes of 30-35 kilometers to the east over the territory of Sweden, Finland and the USSR (approximately to the meridian of the Urals).

The SAMBO-76 experiment was carried out in accordance with the program "International Investigation of the Magnetosphere." Ground methods of research were widely used in this experiment. Scientific institutions of the countries participating in the project are processing the collected information. [5]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-887"

Moscow PRAVDA in Russian 29 Dec 76 p 3

[TASS Report: "'Kosmos-887'"]

[Abstract] The artificial earth satellite "Kosmos-887" was launched in the Soviet Union on 28 December 1976. The satellite was inserted into an orbit with the following parameters:

- initial period, 104.8 minutes;
- apogee, 1,030 kilometers;
- perigee, 973 kilometers;
- orbital inclination, 83 degrees.

CONTINUING FLIGHT OF "SALYUT-5" STATION

Moscow PRAVDA in Russian 23 Dec 76 p 2

[TASS Report: "'Salyut-5': The Flight Continues"]

[Text] Flight Control Center, 22 December. The "Salyut-5" scientific station, which was inserted into near-earth orbit on 22 June 1976, has been in controlled flight with constant orientation toward the earth for six months. Control of the station's apparatus and systems is accomplished by means of an on-board computer complex and by commands from the ground.

By 1200 hours Moscow time on 22 December the station had completed 2,936 revolutions around the earth.

At the present time the orbital parameters of the "Salyut-5" station are:

- apogee, 263 kilometers;
- perigee, 232 kilometers;
- period of revolution, 89.3 minutes;
- orbital inclination, 51.6 degrees.

In accordance with the program of operations in an automatic regime, scientific studies and experiments are being performed. The IR telescope-spectrometer has taken measurements of the characteristics of IR radiation in the upper atmosphere of the earth and also the moon and Orion nebula.

According to telemetry information, all on-board systems, equipment and scientific apparatus of the station are functioning normally.

The flight of the "Salyut-5" station continues. [4]



## TASS ANNOUNCES LAUNCHING OF "MOLNIYA-3" COMMUNICATIONS SATELLITE

Moscow PRAVDA in Russian 29 Dec 76 p 3

[TASS Report: "'Molniya-3'"]

[Text] In accordance with the program for further development of communication systems using artificial earth satellites, on 28 December 1976 a "Molniya-3" communications satellite was launched from the Soviet Union into a high elliptical orbit. The satellite has an on-board repeater apparatus providing for operation of the system in the centimeter wave range.

The "Molniya-3" communications satellite is intended for operation in the system of long-range telephone and telegraph radio communication in the Soviet Union, for transmission of USSR Central Television programs to points in the "Orbita" network, and for international cooperation.

The satellite was inserted into an orbit with the following parameters:  
-- apogee, 40,630 kilometers in the Northern Hemisphere;  
-- perigee, 640 kilometers in the Southern Hemisphere;  
-- period of revolution, 12 hours 16 minutes;  
-- orbital inclination, 62.8 degrees.

In addition to apparatus for transmission of television programs and for providing long-range multichannel radio communication, the satellite carries a command and measurement complex and also systems for orientation, orbital correction and power supply for the satellite.

Communication sessions using the "Molniya-3" satellite will be conducted in accordance with the planned program. [4]

## REPORT ON DISCOVERY RELATING TO EARTH'S MAGNETIC FIELD

Moscow IZVESTIYA in Russian 17 Dec 76 p 6

[Article by I. Novodvorskiy: "Magnetic Storms of the Planet"]

[Text] On 16 December 1976 the State Committee of the USSR Council of Ministers on Inventions and Discoveries recorded a discovery made by Professors V. Troitskaya and M. Mel'nikova who are associates of the USSR Academy of Sciences Institute of Physics of the Earth imeni O. Yu. Shmidt.

Investigations of the outermost shell surrounding our planet (the so-called magnetosphere of the earth) are made using artificial satellites and a global network of ground stations. These investigations are one of the present directions of modern geophysics. The magnetosphere prevents dangerous

cosmic radiation from penetrating to the earth's surface. Investigations of the last decade clearly indicate that the processes in the magnetosphere have a significant effect on the activity of man and his environment. These processes are often powerful disturbances, which in terms of their energy are frequently stronger than the worst earthquakes which originate in the earth's hard crust.

The phenomenon discovered by the authors occurs exactly at the time of the most intensive disturbances (magnetic storms) and gives proof of the deep intrusion into the earth's neighborhood of high-energy particles (protons) which then form a ring of current with an intensity of approximately one million amperes surrounding the earth. Approaching our planet, fluxes of these particles causes fluctuations in the earth's magnetic field and the frequency of these fluctuations increases as the fluxes come closer. These fluctuations have also been detected at the earth's surface during analysis of the fine structure of magnetic storms. The discovery was made possible through the authors' work on organizing a special network of stations equipped with unique, highly sensitive apparatus in the Soviet Union.

Finally, it should be mentioned that the discovered phenomenon presents fundamentally new information on the characteristics of the ring of current surrounding the earth and helps us to take a new step in understanding the mysteries of nature surrounding us. [5]

#### "SALYUT-4" STATION COMPLETES SECOND YEAR IN ORBIT

Moscow PRAVDA in Russian 28 Dec 76 p 2

[TASS Report: "'Salyut-4': Two Years in Orbit"]

[Text] Flight Control Center, 27 December. The "Salyut-4" scientific station, which was inserted into near-earth orbit on 26 December 1974, is continuing its flight.

During this period two expeditions of cosmonauts have worked aboard the station: A. A. Gubarev and G. M. Grechko for a period of thirty days; and P. I. Klimuk and V. I. Sevast'yanov for a period of 63 days.

Subsequently, a joint flight of the "Salyut-4" station and the unmanned "Soyuz-20" ship was performed. This flight lasted for three months.

A wide-ranging program of research and experiments in the interests of science and the national economy has been carried out. Developmental testing has been performed on promising systems for orbital stations and spacecraft.

By 1600 hours Moscow time on 27 December the station had completed 11,585 revolutions around the earth. Orbital parameters for the station are:

- apogee, 277 kilometers;
- perigee, 256 kilometers;
- period of revolution, 89.6 minutes;
- orbital inclination, 51.6 degrees.

In accordance with the program the station is oriented toward the earth or stars while constantly maintaining the optimum position for the solar cells.

On 25 December the latest session of scientific and technical experiments was conducted. According to telemetry data the on-board systems of the station are operating normally. Pressurization and the required microclimate conditions in the station's compartments are being maintained. Air pressure is 730 mm Hg and air temperature is 19°C.

The incoming information is being processed.

The two years of operation of the complex space system represented by the "Salyut-4" station is a significant achievement of Soviet space technology. [4]

### Abstracts of Scientific Articles

#### DETERMINING ANGLE BETWEEN ROCKET AXIS AND DIRECTION TO SUN

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A93

[Abstract of article by V. I. Uybo and A. F. Chizhov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 75-79, "Instrumentation and Methods for Determining the Angle Between the Longitudinal Axis of a Rocket and the Direction to the Sun"]

[Text] The article describes an instrument and method for determining the angle between the direction to the sun and the normal to the entrance window of the optical instrument. Bibliography of three items.  
[162]

#### FLIGHT DYNAMICS OF M-100 ROCKET NOSECONE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A94

[Abstract of article by A. I. Butko and G. A. Kokin; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 93-98, "On the Problem of the Flight Dynamics of the M-100 Meteorological Rocket Nosecone"]

[Text] The authors examine the problem of rotation of the nosecone of the M-100 rocket on the descending branch of the trajectory and orientation along the total velocity vector. The paper gives a detailed analysis of the experimental data and their comparison with theoretical computations. Bibliography of two items.  
[162]

#### CHARACTERISTICS OF MMR-06 METEOROLOGICAL ROCKET

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A95

[Abstract of article by V. I. Ignatenko, E. N. Petrov, V. G. Khvostov, A. A. Shidlovskiy, I. V. Gryts'kiv and A. A. Pozin; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 80-92, "Investigation of the Ballistic and Dynamic Characteristics of the MMR-06 Meteorological Rocket with a Nosecone of the 'Dart' Type"]

[Text] The makeup of an MMR-06 rocket with a nosecone of the "Dart" type is described. The article notes the inadequacies of the standard engine. The paper gives a precise analysis of the aerodynamic scheme of the rocket and its flight logic. Two tables, five illustrations, bibliography of six items. [162]

#### COUNTER FOR REGISTERING SOLAR UV RADIATION

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A90

[Abstract of article by A. V. Dmitriyev, L. S. Sorokin, A. F. Chizhov and O. V. Shtyrkov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 50-56, "Investigation of the Possibilities of Creating a Counter for Registering Solar UV Radiation in the Wavelength Range 1600-1750 A"]

[Text] The article gives the results of development of a photon counter which is suitable for use with the MR-12 meteorological rocket. Together with the descriptions of two types of counters, the article gives the computed altitude (80-150 km) at which the counter will measure the absorption of UV radiation and also the necessary system for attenuating solar radiation. Bibliography of seven items. [162]

#### MEASURING WIND AND THERMODYNAMIC PARAMETERS IN MESOSPHERE-THERMOSPHERE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A89

[Abstract of article by A. S. Butko, I. N. Ivanova, G. A. Kokin and V. G. Repnikov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 36-41, "Instrument Complex for Measuring Wind and Thermodynamic Parameters in the Mesosphere and Thermosphere"]

[Text] The paper describes the nosecone instrumentation of a meteorological rocket designed for measuring the structural parameters of the atmosphere and wind in the altitude range 70-150 km. Bibliography of seven items.  
[162]

#### INSTRUMENT COMPLEX FOR STUDY OF CORPUSCULAR IONIZING RADIATION

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A88

[Abstract of article by V. F. Tulinov, V. M. Feygin, V. A. Lipovetskiy, Yu. M. Kapralov and Yu. M. Zhucenko; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 28-35, "Rocket Complex of Instrumentation for Investigating Corpuscular Ionizing Radiations in the Upper Atmosphere"]

[Text] The authors describe the scientific instrumentation designed for investigations aboard MR-12 meteorological rockets at altitudes 160-180 km. the developed instrument package makes it possible to investigate the composition of corpuscular radiations and also the energy spectra of the electron and proton components in a broad energy range: from  $10^{-1}$  to  $10^3$  keV for electrons and from  $10^{-2}$  to  $10^3$  MeV for protons. Bibliography of 10 items.  
[162]

#### METEOROLOGICAL ROCKET NOSECONES USED IN USSR 1951-1971

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A87

[Abstract of article by Ye. A. Besyadovskiy, N. S. Livshits and A. F. Chizhov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 3-27, "Nosecones of Meteorological Rockets Employed by the Central Aerological Observatory for Investigating the Upper Atmosphere from 1951 to 1971"]

[Text] This review gives a description of the designs of nosecones. The authors give the principal characteristics of scientific instrumentation carried in these nosecones and data on the altitude intervals for use of the employed apparatus. Bibliography of 25 items.  
[162]

#### VLF WAVES INJECTED INTO IONOSPHERE AND MAGNETOSPHERE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A102

[Abstract of article by V. M. Chmyrev, V. K. Roldugin, I. A. Zhulin, M. M. Mogilevskiy, V. I. Di, V. K. Koshelevskiy, V. A. Bushmarin and O. M. Raspopov; Moscow, PIS'MA V ZhETF, 23, No 8, 1976, pp 452-455, "Artificial Injection of VLF Waves into the Ionosphere and Magnetosphere"]

[Text] The authors have discovered variations in the fluxes of electrons leaking from the magnetosphere and short-period pulsations of the earth's magnetic field stimulated by pulsed signals of a ground VLF transmitter. Bibliography of three items.

[162]

#### CLIMATOLOGY OF NOCTILUCENT CLOUDS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A174

[Abstract of article by N. P. Fast; Tomsk, TRUDY TOMSKOGO UNIVERSITETA, No 262, 1975, pp 81-95, "On the Problem of the Climatology of Mesospheric (Noctilucent) Clouds"]

[Text] The seasonal activity of mesospheric clouds (MC) in the northern hemisphere is characterized by the following principal peculiarities: the appearance of MC occurs in the first half of March and the end occurs in the last 10 days of October; 68.7% of the nights with MC and 90.6% of the reports of appearance of MC occur during the summer months, of which 28.3% of the nights and 48.5% of the reports occur in July. The principal latitude-longitude peculiarities of the appearance of MC are as follows: MC appear with an identical frequency at arbitrary longitudes in one and the same latitude zone; on the south observations of MC are limited by latitude  $45^{\circ}$ . On the north observations of these clouds are limited by latitude  $71^{\circ}$ , but individual observations have been made up to latitudes  $81-82^{\circ}$ . The maximum number of observations of MC is in the latitude zone  $53-57^{\circ}$  and occurs in June-July. At latitudes greater than  $60^{\circ}$  they are noted more frequently in March-May and September-October. To the south of latitude  $50^{\circ}$  there is no clearly expressed period of the maximum of appearance of mesospheric clouds. Bibliography of 22 items.

[162]

#### IONOSPHERIC WAVE DISTURBANCES AND ARTIFICIAL SATELLITE SIGNALS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A217

[Abstract of article by B. I. Nurgozhin, Yu. K. Postoyev and B. V. Troitskiy; Gor'kiy, IZV. VYSSH. UCHEB. ZAVEDENIY. RADIOFIZIKA, 19, No 4, 1976, pp 610-613, "Influence of Ionospheric Wave Disturbances on Signals from Artificial Earth Satellites"]

[Text] Using trajectory computations the authors investigated the conditions under which large-scale wave moving disturbances (MD) of the electron concentration in the ionosphere can cause the scintillation of signals from an artificial earth satellite. It is shown that the region of the ionosphere responsible for the scintillations has sharp boundaries and its position and dimensions are dependent on the parameters of the moving disturbance, artificial earth satellite orbit and the working frequency of the transmitter. Bibliography of five items.

[162]

#### RELATIONSHIP BETWEEN MAGNETOSPHERE AND IONOSPHERE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A277

[Abstract of article by Ya. I. Fel'dshteyn; Moscow, FIZ. IONOSFERY, 1976, pp 37-39, "The Earth's Magnetosphere. Relationship Between the Magnetosphere and the Ionosphere"]

[Text] This paper briefly sets forth the content of lectures devoted to a description of modern concepts concerning phenomena in circumterrestrial space. The following subjects are included: formation of the magnetosphere, reaction of the magnetosphere to a change in conditions in interplanetary space, generation and course of magnetospheric substorms and their appearance in the ionosphere, interaction between the magnetosphere and the ionosphere.

[162]

#### SYSTEM FOR THERMAL SOUNDING OF ATMOSPHERE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9B110

[Abstract of article by Yu. M. Timofeyev; Leningrad, PROBLEMY FIZ. ATMOSFERY, No 13, Leningrad University, 1976, pp 105-112, "Physical Principles of an Operational System for Thermal Sounding of the Atmosphere"]

[Text] The article examines the fundamental principles for creating an operational system for processing satellite measurements of outgoing thermal radiation in the problem of indirect determination of the principal physical



parameters of the state of the atmosphere. Bibliography of 15 items.

#### EXPERIMENTS IN IONOSPHERE AND MAGNETOSPHERE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A97

[Abstract of article by V. V. Migulin; Moscow, FIZ. IONOSFERY, 1976, pp 49-51, "Active Experiments in the Ionosphere and Magnetosphere"]

[Text] The paper describes methods for investigating the earth's magnetosphere and ionosphere based on a study of the effects caused by different kinds of artificial agents (active experiments). The authors give descriptions of the following types of artificial modification of circumterrestrial plasma: a) effect of powerful radio-frequency radiation causing changes in the electron concentration and electron temperature in limited regions of the ionosphere; b) effect of powerful low-frequency electromagnetic radiation causing effects associated with interaction between plasma in the geomagnetic field and electromagnetic waves; c) effect by means of injecting beams of high-energy electrons and plasma directly into the atmosphere. The principal results obtained when carrying out active experiments are briefly characterized.

[162]

#### IONOSPHERIC DISTURBANCES CAUSED BY POWERFUL RADIO RADIATION

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A98

[Abstract of article by G. G. Getmantsev, L. M. Yerukhimov, E. Ye. Mityakova, N. A. Mityakov, N. M. Prytkov, V. O. Rapoport and V. A. Cherepovitskiy; Gor'kiy, IZV. VYSSH. UCHEB. ZAVEDENIY. RADIOFIZIKA, 19, No 4, 1976, pp 505-509, "Some Results of Investigation of Ionospheric Inhomogeneities Induced by Powerful Radio Radiation Using Ground Reception of Signals from an Artificial Earth Satellite"]

[Text] This is an analysis of an experiment (December 1974-January 1975 in the polygon at the Scientific Research Radiophysics Institute at Zimenki) for studying inhomogeneities of electron concentration arising under the influence of powerful short-wave radiation on the F layer of the ionosphere. The paper gives the preliminary results of measurements of the spectrum of concentration of electrons in the disturbed region by means of ground reception of signals of artificial earth satellites. Irradiation of the ionosphere was at a frequency of 5.75 MHz; the radio transmitter had a power

of  $P = 130$  kW; the antenna had an amplification factor  $G \approx 150$ . It was possible to register the amplitude of signals of several American artificial earth satellites (Nimbus-5, NOAA-2) at frequencies 136-137 MHz. A powerful radio transmitter was switched on for 15-150 minutes before the artificial earth satellite passed through the center of the disturbed region. In some cases for purposes of studying relaxation processes the radio transmitter was switched off for 10-30 sec before the indicated moment. A study was made of the intensity and spectrum of fluctuation of the amplitude of signals passing through the disturbed region. Bibliography of five items. [162]

#### MODEL OF SOLAR-ATMOSPHERIC RELATIONSHIPS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A21

[Abstract of article by A. I. Ivanovskiy and A. A. Krivolutskiy; Dolgoprudnyy, REZONANSNAYA MODEL' SOLNECHNO-ATMOSFERNYKH SVYAZEY, Central Aerological Observatory, 1976, 69 pages, manuscript deposited at the All-Union Institute of Scientific and Technical Information, 19 April 1976, No 1343-76 DEP]

[Text] The authors propose a resonance mechanism of solar-atmospheric relationships. Solution of the equations of hydrodynamics, energy and continuity equations is sought in the form of travelling waves. The authors use the approach of the theory of tides. It is shown that in the presence of an external periodic source (fluctuations in the flux of solar radiation with a period of 27 days with an amplitude of 1%) and large-scale longitude inhomogeneities of the field of atmospheric parameters there can be resonance conditions in the earth's atmosphere, which leads to the excitation of planetary waves -- Rossby waves. The amplitudes of waves in resonance can attain 10-15 mb; the equilibrium time is five to seven months. [162]

#### SUPERREGENERATIVE RADAR TRANSPONDER

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A91

[Abstract of article by A. V. Komotskov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 57-61, "Use of a Superregenerative Radar Transponder for Transmitting Rapidly Changing Information"]

[Text] A study was made of the possibility of using a superregenerative radar transponder for the transmission of rapidly changing telemetric information from small meteorological rockets. For this purpose it is possible to

use telemetric frequency modulation of the superization generator voltage by the sensor signal. The article describes the block diagrams of the on-board and ground parts of a single-channel telemetric line and some results of tests of the radio link. Bibliography of six items.  
[162]

#### TRAJECTORY MEASUREMENTS FOR METEOROLOGICAL ROCKETS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 9, 1976, 9A92

[Abstract of article by V. I. Yermakov, A. V. Komotskov and N. S. Livshits; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 119, 1976, pp 62-74, "Radio Apparatus for Telemetric and Trajectory Measurements of Meteorological Rockets"]

[Text] The article describes on-board and surface apparatus for a matched radioelectronic system for telemetric and trajectory measurements for meteorological rockets. The system ensures transmission of meteorological information from aboard the rocket at a rate of about 40 measurements per second through sixty channels. The accuracy of data transmission is 1%. In addition, it ensures measurement and registry of the current coordinates of the target (elevation angle, azimuth and slant range) and time. Bibliography of four items.  
[162]

#### RECENT "VENERA" DESCENT MODULES DESCRIBED

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 5, 1976, pp 655-666

[Article by V. S. Avduyevskiy, N. F. Borodin, V. P. Burtsev, Ya. V. Malkov, M. Ya. Marov, S. F. Morozov, M. K. Rozhdestvenskiy, R. S. Romanov, S. S. Sokolov, V. G. Fokin, Z. P. Cheremukhina and V. I. Shkirina, "Automatic Stations 'Venera-9' and 'Venera-10' -- Functioning of Descent Modules and Measurement of Atmospheric Parameters"]

[Abstract] The paper gives the main technical specifications used for "Venera-9" and "Venera-10" stations and procedures for the landing of descent modules on the planetary surface. Also included is an analysis of the results of direct measurements of temperature and pressure from an altitude of 63 km to the surface and also the accelerations experienced in the segment of aerodynamic braking of the descent module in the atmosphere using accelerometers carried aboard it. The totality of the measurements confirms the dependence of atmospheric parameters on altitude, established on the basis of data from earlier flights and the soundness

of the model of the Venusian atmosphere constructed on their basis. At the same time there is a tendency to a higher daytime temperature in comparison with the nighttime temperature at altitudes greater than 40-50 km. Temperature and pressure at the surface are 460°C and 90 atm, evidence of an excess of the landing regions of 1.5-2 km relative to the mean level surface, corresponding to a Venusian radius of 6,051 km.  
[141]

#### WIND VELOCITY AND TURBULENCE ON VENUS

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 5, 1976, pp 714-721

[Article by N. M. Antsibor, R. V. Bakit'ko, A. L. Ginzburg, V. T. Guslyakov, V. V. Kerzhanovich, Yu. F. Makarov, M. Ya. Marov, Ye. P. Molotov, V. I. Rogal'skiy, M. K. Rozhdestvenskiy, V. P. Sorokin and Yu. N. Shnygin, "Estimates of Wind Velocity and Turbulence Based on Relay Doppler Measurements of Velocity of the Descent Modules of the Automatic Interplanetary Stations 'Venera-9' and 'Venera-10'"]

[Abstract] The paper cited above gives the results of determination of the horizontal component of wind velocity by the method of discriminating the Doppler component of the signal of the on-board radio transmitters of descent modules. This method in its principle is similar to that employed earlier in flights of the automatic stations "Venera" and "Mars." Its complexity in these experiments, with the use of orbital vehicles as relay stations, involves the necessity for discriminating the component caused by motion of the vehicle in the atmosphere. The results of the measurements in general agree with the conclusions drawn from measurements made aboard the "Venera-4, 7, 8" stations on the presence of an altitude-variable zonal component of wind velocity attaining about 60 m/sec near an altitude of 50 km.  
[141]

#### LUMINESCENCE OF THE VENUSIAN NIGHT SKY

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 5, 1976, pp 789-795

[Abstract of article by V. A. Krasnopol'skiy, A. A. Krys'ko, V. N. Rogachev and V. A. Parshev, "Spectroscopy of the Night Airglow of Venus on the 'Venera-9' and 'Venera-10' Automatic Interplanetary Stations"]

[Abstract] The authors used a special highly sensitive diffraction spectrometer for multiple registry of the glow spectrum of the night sky of the planet in the range from 3000 to 8000 Å. There was found to be

a stable system of emission bands; the problem of identifying these was extremely difficult. Only recently was it established that the very most important band belongs to molecular oxygen. It is strongly forbidden and is not observed in the glow of the earth's upper atmosphere. The reliable experimental data presented in this paper on the spectral composition of the night airglow of the Venusian upper atmosphere have been obtained for the first time.

[141]

#### RADIOACTIVE ELEMENTS IN VENUSIAN ROCKS

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 5, 1976, pp 704-709

[Article by Yu. A. Surkov, F. F. Kirnozov, V. N. Glazov, A. G. Dunchenko and L. P. Tatsiy, "Content of Natural Radioactive Elements in Venusian Rocks According to Data from the 'Venera-9' and 'Venera-10' Automatic Interplanetary Stations"]

[Abstract] The photographs transmitted to the earth from Venus do not contain data on the nature of Venusian rocks and their composition. For that reason the stations carried gamma spectrometers for determining the content of natural radioactive elements in the rock on the basis of their gamma radiation. The instrumentation is described in detail in this paper, accompanied by a block diagram. The work program is given, followed by the results of measurements and their processing. The content of U, Th and K in the rocks of Venus and the earth is compared. It was found that at the landing sites of the "Venera-9" and "Venera-10" there are rocks similar in their content of natural radioactive elements to terrestrial rocks of the basalt type. The concentration of potassium, uranium and thorium in the rocks at the "Venera-10" site is somewhat lower and it is possible that these rocks have a more basic composition (lesser content of silicon dioxide, etc.) in comparison with the rocks surrounding the "Venera-9" station. It appears that these Venusian rocks are a product of relatively shallow differentiation of the primary matter of the planet. The ratio of potassium to uranium is  $1-2 \cdot 10^4$ , which is characteristic for terrestrial basaltic rocks.

[141]

#### RADIO PROBING OF THE VENUSIAN ATMOSPHERE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian, No 5, 1976, pp 722-728

[Article by O. I. Yakovlev, A. I. Yefimov, T. S. Timofeyeva, G. D. Yakovleva, Ye. V. Chub, V. F. Tikhonov and V. K. Shtrykov, "The Venusian Atmosphere According to Preliminary Data from Radio Probing Using the

### 'Venera-9' and 'Venera-10' Vehicles"]

[Abstract] During the period from October through December 1975 and also in March 1976 Soviet specialists carried out 50 radio probings of the Venusian atmosphere using the satellites "Venera-9" and "Venera-10." During motion of the satellites in the penumbra zone it was possible to carry out successive radio probings of the atmosphere and ionosphere of the planet by radio waves. The wavelength in these experiments was 32 cm. The transmission of radio waves was through a directional parabolic antenna mounted on the satellite and reception was at the earth at the Deep Space Communications Center. When the vehicle descended below the planet's horizon the atmosphere was probed on the night side of the planet and when it emerged from behind the planetary limb -- on the daytime side. This paper gives the results of 11 radio probings. A block diagram illustrates processing of the experimental data; graphs show the dependence of density of molecules on altitude, the dependence of pressure on altitude, temperature as a function of altitude, correlation between temperature and pressure, electron concentration as a function of altitude in the Venusian ionosphere, etc. The daytime and nighttime atmospheres are discussed separately. The data are considered reliable.

[141]

### NEPHELOMETRIC MEASUREMENTS ABOARD "VENERA" VEHICLES

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 5, 1976, pp 729-734

[Article by M. Ya. Marov, B. V. Byvshev, K. N. Manuylov, Yu. I. Baranov, I. S. Kuznetsov, V. N. Lebedev, V. Ye. Lystsev, A. V. Maksimov, G. K. Popandopulo, V. A. Razdolin, V. A. Sandimirov and A. M. Frolov, "Nephelometric Measurements on the 'Venera-9' and 'Venera-10' Stations"]

[Abstract] The descent modules of the "Venera-9" and "Venera-10" automatic stations were used in experiments for determining the vertical structure and microphysical characteristics of the aerosol component of the atmosphere and clouds. The research method was based on active sounding of the atmosphere by the radiation of an artificial source and registry of the indices of directed scattering at several fixed angles. The MNV-75 nephelometric complex was developed for this purpose. The instrument is described in detail, accompanied by diagrams of the optical system. Data are given on the dependence of the measured values of the indices of directed scattering on altitude for nephelometer channels 4, 15, 45 and 180°. The data indicate a rather high transparency in clouds, which in fact resemble a weak fog or haze. The data do not contradict the hypothesis of sulfuric acid being the principal component of cloud particles above 49 km. The aerosol component of the atmosphere discovered in the region of altitudes between 49 and 18 km probably extends down to the surface of the planet.

[141]

#### OBSERVATIONS OF SCORPIO X-1 ABOARD "SALYUT-4"

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 2, No 11, 1976, pp 528-533

[Article by Ye. I. Moskalenko, V. G. Kurt, Ye. K. Sheffer, L. G. Titarchuk and I. A. Golovanov, State Astronomical Institute and Space Research Institute, "Scorpio X-1 -- Observations from Aboard the 'Salyut-4' Station in January 1975"]

[Abstract] The source Sco X-1 was observed using the "Filin" instrument carried aboard the "Salyut-4" station during the period 15-17 January 1975. During the observation period the projection of the orbital plane onto the celestial sphere was situated near the source. Flight of the station passed in a regime of orientation on the local zenith. The slit directional diagram of the telescope was perpendicular to the direction of motion in the celestial sphere. The source intersected the narrow side of the field of view ( $3^\circ$ ) during a time of about 100 sec and was observed in five transits. The most characteristic peculiarity of this series of observations is a strong variability from observation to observation of the stream in the energy region  $> 2$  keV relative to the stream in the region 2-10 keV. The article examines two variants of the interpretation: 1) radiation of optically thin plasma with variable absorption or a temporarily appearing additional source in the low-energy region; 2) radiation of plasma with a great optical thickness for Thomson scattering  $\tau_T \sim 12$  and a temporarily appearing "soft" source.

[149]

#### OBSERVATIONS OF NIGHTTIME IONOSPHERE OF VENUS

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 6, 1976, pp 824-826

[Article by Yu. N. Aleksandrov, M. V. Vasil'yev, A. S. Vyshlov, G. G. Dolbzhnev, V. M. Dubrovin, A. L. Zaytsev, M. A. Kolosov, G. M. Petrov, N. A. Savich, V. A. Samovol, L. N. Samoznayev, A. I. Sidorenko, A. F. Khasyanov and D. Ya. Shtern, "Nighttime Ionosphere of Venus Determined from the Results of Two-Frequency Radio Probing Using the 'Venera-9' and 'Venera-10' Satellites"]

[Abstract] The article gives the principal results of 19 periods of two-frequency radio probing of the Venusian nighttime ionosphere carried out during the period 24 October-7 December 1975. An important peculiarity of all profiles of the nighttime ionosphere of Venus is its insignificant extent, which in different sessions was from 30 to 50 km. The two satellites made it possible to carry out multiple radio probing of the Venusian ionosphere, give a phenomenological classification of the vertical profiles of

electron concentration over the nighttime side of the planet and discriminate special cases differing sharply in their characteristics from ordinary cases. The experimental data indicate a considerable variability of the parameters of the nighttime ionosphere of Venus which evidently reflects considerable variations of the ionization source.

[168]

#### INTERACTION OF SOLAR WIND WITH VENUS

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 6, 1976, pp 827-838

[Article by O. L. Vaysberg, S. A. Romanov, V. N. Smirnov, I. P. Karpinskiy, B. I. Khazanov, B. V. Polenov, A. V. Bogdanov and N. M. Antonov, "Structure of the Region of Interaction Between the Solar Wind and Venus According to Measurements of the Characteristics of the Stream of Ions on the Automatic Interplanetary Station 'Venera-9' and 'Venera-10'"]

[Abstract] The following conclusions can be drawn on the basis of "Venera-9" and "Venera-10" observations: 1) near Venus there is constantly a head shock wave and its position agrees with theoretical computations made using a gas-dynamical model with  $H/r_0 = 0.01-0.02$ ; 2) in front of the shock wave there is a broad region of a disturbed state of the wind; 3) the jumps of parameters of the solar wind in the shock wave agree with the prediction of the gas-dynamical model; 4) within the transition region there is a decrease in stream density and a decrease in the high-energy distribution tail; this region is bounded by a rarefaction wave identified from the local increase in fluctuations; 5) on the nighttime side of Venus there is a region of low-energy directed streams of ions; 6) the regions of external and internal streams are separated by the ionopause, identified on the basis of the change in the parameters of the ion streams and on the basis of the increase in fluctuations; the determined position of the ionopause in space agrees with computations using a gas-dynamical model with  $H/r_0 = 0.01-0.02$ ; 7) near the ionopause there are sometimes bursts of high-energy particles with an energy of several keV; 8) in the transition region, in the rarefaction region and in the inner region one sporadically observes the appearance of directed streams with a two-component structure of the high-energy spectra, which can indicate a mutual penetration of the outer and inner streams. The existence of a region of rarefaction, directed ion streams internal relative to the ionopause and mixed streams of two ion components must be regarded as proof of viscous interaction of the thermalized solar wind with the Venusian atmosphere.

[168]

#### PLASMA MEASUREMENTS WITH THE "VENERA-9" AND "VENERA-10" SATELLITES

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 6, 1976, pp 839-851



[Article by K. I. Gringauz, V. V. Bezrukikh, T. K. Breus, M. I. Verigin, G. I. Volkov, T. Gomboshi and A. P. Remizov, "Preliminary Results of Measurements of Plasma Using Wide-Angle Instruments on the 'Venera-9' and 'Venera-10' Satellites"]

[Abstract] Using wide-angle plasma instruments the authors carried out multiple measurements of the electron and ion components of plasma in the optical and corpuscular shadows of Venus, in the corpuscular penumbra, in the transition region, with intersection of the front by the circumplanetary shock wave and in the solar wind. In the optical and corpuscular shadows of the planet there are streams of electrons corresponding to a concentration  $n_e \sim 1 \text{ cm}^{-3}$  and a temperature  $T_e \sim 2-5 \cdot 10^{50} \text{ K}$ ; the streams of ions in these regions fluctuate and are distributed randomly in all energy intervals to 4.4 keV. The discovered streams of electrons can ionize the neutral atmosphere of Venus and explain the existence of its nighttime ionosphere. Several hundred kilometers above the optical shadow there is a corpuscular penumbra; the plasma velocity in it is less than in the transition region. In the transition region the streams of charged particles fluctuate strongly; estimates of the plasma concentration show its considerable increase during satellite flight from the corpuscular penumbra to the shock wave front. Measurements made during multiple intersections of the front by the circumplanetary shock wave indicated that the structure of the front changes very greatly with time (from a sharp front with a thickness of about 10 km to a diffuse front extending about 3,000 km).

[168]

#### TRAJECTORY MOTIONS OF DESCENT MODULES IN MARTIAN ATMOSPHERE

Moscow KOSMICHESKIYE ISSLEDOVANIYA in Russian No 6, 1976, pp 936-943

[Article by Ye. P. Shapovalov and V. V. Kubyshkin, "Optimum Trajectories of Motion of Descent Modules with Two-Dimensional Control in the Martian Atmosphere"]

[Abstract] A study was made of the variational problem of the minimum finite velocity during descent in the Martian atmosphere of a vehicle with a mean aerodynamic quality ( $K < 0.9$ ) controllable with respect to angle of attack ( $\alpha$ ) and banking angle ( $\gamma$ ). The article examines control of motion of the center of mass of the descent module, drag and lift. It is assumed that descent occurs on a nonrotating planet having a spherical configuration. A solution is sought using necessary conditions of the maximum principle type. The paper gives the results of solution corresponding to the boundary value problem. The author also examines possible rational controls in a segment where the first-order maximum principle is not satisfied (special control segment).

[168]

#### METHOD FOR INVESTIGATING ACCURACY OF AES PHOTOTELEVISION TRACKING

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEODEZIYA I AEROFOTOS"YEMKA in Russian No 4, 1976, pp 57-63

[Article by N. S. Zabolotnyy, Moscow Institute of Geodetic, Aerial Mapping and Cartographic Engineers, "Use of the Orbital Method for Investigating the Accuracy of Phototelevision Tracking of Artificial Earth Satellites"]

[Abstract] A search for independent methods for evaluating the accuracy of phototelevision tracking of faint artificial earth satellites is of great interest. The author feels that the use of short arcs can be useful in evaluating the accuracy of operation of a phototelevision system. The essence of the proposed method is as follows: 1. It is necessary to obtain "n" series of topocentric coordinates of the observed faint artificial earth satellite with an accuracy comparable to the accuracy of fixation of observation time. By integration of the differential equations of motion of an object for these same moments for which the observations are made it is possible to compute independently the topographic coordinates under the condition that the integration precisely takes into account all the perturbing factors and the initial conditions for integration are known precisely. This can be accomplished on a short arc tightly filled with measurements. 2. Comparison of the series makes it possible to judge the accuracy of both television tracking and the orbital method.

[185]

#### MOTION OF AURORAL PARTICLES IN MAGNETOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol XVI, No 6, 1976, pp 1066-1071

[Article by M. V. Samokhin, Radioengineering Institute USSR Academy of Sciences, "Adiabatic Motion of Auroral Particles in Magnetosphere. 3. Neutral Layer Field"]

[Abstract] A study was made of the motion of auroral particles with pitch angles  $\sim 90^\circ$  in the tail of the magnetosphere. Computations of trajectories of mean drift are made analytically by expansion into a series near the mirror point. It is shown that the particles drift approximately along equipotential lines. With a decrease in geocentric distance the mirror points rise above the equatorial plane. The author discusses the possibility of the penetration of solar wind protons into the convection region through the evening boundary of the magnetosphere as a result of gradient and centrifugal drifts; these electrons cover distances of  $\sim 1,000 R_E$  and have stationary closed drift orbits passing partially within and partially outside the magnetosphere.

[144]

## SFD DURING SOLAR FLARES

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol XVI, No 6, 1976, pp 1013-1017

[Article by V. D. Novikov and I. N. Odintsova, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Nature of Dependence of the SFD Level During Solar Flares on Working Frequency"]

[Abstract] The authors propose a method for evaluating the dependence of the Doppler frequency shift  $\Delta f$  during the time of solar flares on the working frequency  $f$  for different reflection altitudes. It is shown that the nature of the dependence of  $\Delta f$  on  $f$  is determined by the range of working frequencies and the altitudes at which there is a change in the electron concentration during the time of a flare. It is shown that within the framework of the considered model of the ionosphere the  $\Delta f$  value when  $f < f_0E$  is determined only by changes in the electron concentration in the E region and increases rapidly with the approach of  $f$  to  $f_0E$ . At frequencies exceeding  $f_0E$  the nature of the  $\Delta f(f)$  dependence is determined by the altitude at which the electron concentration changes at the time of a flare. If these changes are concentrated only in the D and E regions, then  $\Delta f$  decreases inversely proportionally to the working frequency. Allowance for changes in the electron concentration in the F1 and F2 regions leads to a more complex dependence  $\Delta f(f)$ . The maximum  $\Delta f$  values are obtained at frequencies corresponding to reflection from F1. Analysis of the dependence of  $\Delta f$  on the working frequency indicates that by using the Doppler method it is possible to obtain the  $\Delta N(h)$  profiles for the ionosphere during solar flares. For more precise determination of the nature of the dependence of  $\Delta f$  on  $f$  it is necessary to increase the number of fixed frequencies during Doppler measurements to seven or eight frequencies.

[144]

## GEOPHYSICAL EFFECTS OF SOLAR ACTIVITY ON UPPER ATMOSPHERE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol XVI, No 6, 1976, pp 1018-1025

[Article by Ya. Lashtovichka and N. I. Fedorova, Geophysical Institute Czechoslovakian Academy of Sciences and USSR Space Research Institute, "International Coordinated Measurements of Geophysical Effects of Solar Activity in the Upper Atmosphere. III. An Unusual Middle-Latitude Ionospheric Disturbance of Corpuscular Origin"]

[Abstract] This paper describes a sudden ionospheric disturbance of a special type which occurred on 17 June 1970 and which was observed by the network of stations and by the "Kosmos-348" satellite. The event occurred at about 1050 UT and was detected by three observatories: Pan'ska Ves' (CzSSR), Neustrelitz and Kuhlungsborn (GDR) under the "Interkosmos"

program. The disturbance was not very strong but was clearly expressed. It was manifested only in a definite interval of altitudes in the ionospheric D region. In this paper it is shown that the SID effects observed in this case can be satisfactorily explained if it is postulated that under daytime conditions simultaneously with a weak chromospheric flare there was a considerable intensification of leakage of high-energy electrons in the middle latitudes. This leakage effect over a time not greater than one minute was propagated to the nighttime side and was registered by the satellite at the same L-shells. These electrons at  $L \approx 2$  had energies of 20-150 keV.

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#### STRUCTURE OF INTERPLANETARY STREAM FROM POWERFUL FLARE

Moscow GEOMAGNETIZM I AERONOMIYA in Russian Vol XVI, No 6, 1976, pp 970-975

[Article by Ye. G. Yeroshenko and K. G. Ivanov, Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation, "Hydromagnetic Structure of Interplanetary Stream from the Powerful Flare of 4 August 1972"]

[Abstract] Analysis of magnetic measurements in interplanetary space near the earth in combination with other data agree with the following hypotheses: 1) during the period 4-5 August 1972 there was a stream with a typical hydromagnetic structure consisting of a sequence of a head shock layer, magnetic region and flare plasma, 2) the configuration of the stream differed considerably from spherically symmetric (there was a slant incidence on space objects near the earth), 3) there was a double intersection of the front by flare plasma caused by a change (fluctuation) in the position of this front.

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